TROPICAL DISEASES BUREAU.

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THEILERIASIS.

(135) CARPANO (M.). **Piroplasmosi tipo "parvum" nei bovini del basso bacino del Mediterraneo (Febre della costa mediterranea).** [Piroplasmosis of the "parvum" Type in Cattle on the Southern Border of the Mediterranean. Mediterranean Coast Fever.]—*La Clinica Vet.* 1915. June 30. Vol. 38. No. 12. pp. 497–529; July 15 & 30. No. 13–14. pp. 553–596. With 2 plates comprising 12 figs., 14 text-figs. & 4 charts.

The author has studied this disease in imported Serbian cattle, of which 100 per cent. became infected and 90 per cent. died. Clinically, an acute or fulminant form, a subacute, and a chronic form may be recognised.

In the acute form the period of incubation may range from 10 to 30 days, the disease being ushered in with a rapid rise of temperature. For two or three days nothing abnormal may be observed, but then rumination ceases, the appetite becomes capricious, the temperature remains high, and the pulse and respirations become very rapid. The blood remains unaltered to the naked eye, and parasites may be numerous or scanty in it. The urine remains clear. There is a watery discharge from the eyes, the eyelids become oedematous, and the superficial lymphatic glands become enlarged. The visible mucous membranes show petechiae or haemorrhages, and muscular spasms and contractions occur. Within four or five days the temperature falls and the animal dies.

The subacute form has been most frequently observed, and the symptoms resemble those seen in the acute cases, but they do not follow each other so rapidly. In this form the duration of the disease is about one to three weeks and, if the infected animal survives, the disease acquires the characters of the chronic form.

In this form of the disease the temperature curve is rather characteristic. There are marked elevations of temperature which persist for from two to eight days, and are separated from each other by afebrile periods. In cases in which recovery is going to take place the febrile periods become gradually less marked.

The symptoms are those of a chronic piroplasmosis. The skin becomes harsh and adherent, the mucous membranes are jaundiced, and the urine contains albumen and is stained with bile. Microscopic examination of sediment from the urine shows epithelial casts. Pulse and respirations are accelerated, the former being sometimes almost imperceptible.

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Examination of the blood may show that the number of red corpuscles has fallen as low as 3,000,000 per cubic millimetre, and there is a hyperleucocytosis. The usual corpuscular abnormalities are present.

The lesions generally observed in diseases of the kind are found, but one which the author considers to be pathognomic is the presence in the abomasum of numerous round or oval ulcers. Similar lesions have been observed in the colon and caecum.

The lymphatic glands are enlarged and oedematous, but sometimes the liquid contained in them is blood tinged, and they may show haemorrhagic infarcts.

Microscopic examination of sections of the spleen shows the presence of gamonts and agamonts.

According to the author there is evidence that the disease is not caused by a single organism, but by two distinct species which are associated with each other. [There seems to be a gap in the text here.] One of these is said to be identical with *Theileria parva*, and the other with *Piroplasma annulatum*. In severe cases more than 90 per cent. of the corpuscles may be invaded. Rounded or ring forms, oval and pear shaped parasites, bacillary forms, flagellated and amoeboid types, and granule-like or anaplasma forms may be found in the blood.

Multiplication may be by simple division, or by division into four, producing the cross forms similar to those described by NUTTALL in *Nuttallia equi*. The former is said to occur in the acute forms of the disease and the latter in the chronic.

The author has made artificial cultures by adding to 9 cc. of sterile defibrinated blood containing the parasite, 1 cc. of distilled water containing 7 per cent. each of sodium chloride and sodium citrate, the tubes being incubated at 25° C.

At about the tenth day anaplasma-like forms make their appearance, and subsequently flagellate forms similar to those found in infected ticks are seen.

It is practically certain that under natural conditions the disease is spread by *Hyalomma aegyptium* and, as only adult specimens of this tick have been found on the animals, the possibility is suggested that the larval and nymphal stages may be passed on other animals.

Details of some experimental inoculations are given.

(136) NUTTALL (G. H. F.). **Experimental Drug Treatment of East Coast Fever of Cattle.**—*Parasitology*. 1915. June. Vol. 8. No. 1. pp. 56–87.

In this paper the author publishes details of 18 experimental cases of the disease in which various drugs were tested as to their curative actions. In no case has success been obtained, but the results are published as they may afford some assistance to others working on the same subject.

The following drugs were tried: Congo red, sodium salicylate, trypasafrol, creosote and oil of copaiva, soamin, arsacetin, "606," emetine hydrochloride, mercury salicylate, mercury succinimide, quinine hydrochloride, ethylhydrocupreine, ammonium fluoride, potassium iodide, calcium lactate, and nuclein. All the treated animals

died and showed typical lesions at the post-mortem. They were all infected experimentally by means of *Rhipicephalus appendiculatus*, which had been fed upon infected animals either as larvae or nymphs and were placed upon the experimental animals as nymphs or adults.

(137) PRIESTLEY (H.). *Theileria tachyglossi* **(n. sp.) a Blood Parasite of** *Tachyglossus aculeatus.*—*Ann. Trop. Med. & Parasit.* 1915. June 30. Vol. 9. No. 2. pp. 233–238. With 1 coloured plate comprising 16 figs.

The parasite described in this paper was found in the blood of an echidna from the neighbourhood of Townsville, Queensland. As no parasites were discoverable in the blood after an interval of a week the animal was killed and preparations were made from the internal organs. Good films of blood could not be obtained by the wet fixation method, but preparations from the organs treated in that way gave very good results.

The parasite very closely resembled *Theileria parva*, and the same morphological types were found. The majority were rod-shaped and measured 1·8 to 3 microns in length by 0·3 to 0·8 in thickness. On two occasions cross forms were seen. Multiple infection of the cells was very rare.

Bodies resembling Koch's granules were found in the blood in small numbers, but in smears made from the liver, lungs, and spleen they were very numerous. In these organs they were both free and included in endothelial cells and leucocytes.

The echidna from which the parasites were obtained was infested with ticks—*Aponomma decorsum*—and was apparently healthy.

TRYPANOSOMIASIS.

(138) DELANOË (P.) **Des variations du pouvoir infectieux et de la virulence de** *Trypanosoma dimorphon* **L. et M. Troisième note.** [Variations of Infectivity and Virulence of *T. dimorphon* L. and M. Third Note.*]—*Bull. Soc. Path. Exot.* 1915. May. Vol. 8. No. 5. pp. 314–331. With 1 fig.

In this paper the author details at considerable length a large number of experiments in which a strain of *T. dimorphon* derived from a sheep in the first instance was inoculated into a number of different species of animals and then into the guinea-pig and white rat.

The general conclusions may be summarised as follows :—

The guinea-pig and the white rat appeared to possess a complete immunity to the trypanosome whatever method of inoculation was resorted to, whether the strain was taken direct from the original sheep or whether it had been first passed through the kid or goat, or through *Golunda campanae*. The absence of pathogenic power for the white

* For abstracts of the Preliminary and Second Notes, see this *Bulletin*, Vol. 2, No. 1, p. 68, and No. 3, p. 134.

rat is all the more remarkable since the trypanosome is very pathogenic for *Golunda*. It was also found that the strain was incapable of infecting two other species of Muridae, namely, *Arvicanthis niloticus Richardi*, and *Mus concha*.

Cercopithecus callitrichus and an indigenous species of dog also completely resisted inoculation.

(139) Yakimoff (W. L.) & Marmer (R.). **Les changements du sang provoqués par l'infection du chien avec le trypanosome des chameaux du Turkestan.** [The Alterations produced in the Blood of a Dog infected with the Trypanosome of the Camel in Turkestan.] —*C. R. Soc. Biol.* 1915. June 25. Vol. 78. No. 11. pp. 343–345.

A dog inoculated intraperitoneally with a large quantity of blood containing trypanosomes died on the 34th day.

Trypanosomes appeared in the peripheral blood at intervals. The number of red corpuscles steadily decreased from six millions to about $2\frac{3}{4}$ millions at the time of death.

There was a primary leucocytosis followed by a period during which the number of leucocytes was practically normal with a tendency to leucopenia, and finally a leucocytosis.

The lymphocytes and the neutrophile polynuclears were chiefly concerned in these changes. The former showed a diminution followed by an increase and again a diminution.

(140) Sergent (Edm.), Lhéritier (A.) & Belleval (G.). **Sur le *Trypanosoma marocanum*, n. sp., agent d'une épizootie équine à Casablanca en 1911.** [*Trypanosoma marocanum* n. sp., the Cause of an Epizootic among Horses at Casablanca in 1911.]—*Bull. Soc. Path. Exot.* 1915. July. Vol. 8. No. 7. pp. 433–438.

The trypanosome is said to be indistinguishable morphologically from trypanosomes already encountered in outbreaks among horses. It is a monomorphic trypanosome averaging 18 microns in length (maximum 24 and minimum 16) and from 1·5 to 2·5 in width. There is a free portion of the flagellum.

In horses death generally takes place in some weeks. A dromedary appeared to be less susceptible to the infection than to the virus of debab. Goats were susceptible but recovered. Dogs died in about two months. Mice, rabbits and guinea-pigs are all susceptible, death taking place in the first two species in from two to three weeks, and in the last in about twice that time.

Cross-immunity experiments have shown that the trypanosome is distinct from *T. berberum*, *T. equiperdum*, and *T. soudanense*. For this reason the authors propose the name *T. marocanum*.

(141) Lanfranchi (A.). **Sur le passage des trypanosomes dans le lait.** [The Passage of Trypanosomes into the Milk.]—*Bull. Soc. Path. Exot.* 1915. July. Vol. 8. No. 7. pp. 438–442.

The author has carried out a small number of experiments with *T. brucei*, *T. evansi*, *T. rhodesiense*, and *T. gambiense* with the object of ascertaining whether new-born animals can contract infection

through the medium of the milk, whether trypanosomes can be demonstrated by direct examination of the milk, and whether the infectivity of the milk can be demonstrated by intraperitoneal inoculation of rats and mice.

In the first experiment, in which a pomeranian bitch was inoculated with *T. brucei* some hours after whelping, two of the pups died on the 12th day, and although examination of their blood was negative, it was proved to be infective by the inoculation of rats. Similarly, microscopic examination of the milk was constantly negative, but it was found to contain trypanosomes by inoculation.

In another experiment a bitch was inoculated intravenously with blood containing *T. rhodesiense*. None of the puppies born the day prior to inoculation became infected, and trypanosomes could not be discovered in the milk by microscopic examination. One mouse out of several inoculated with milk on different days became infected.

In a similar experiment carried out with the virus of surra entirely negative results were obtained.

In the last experiment, which was carried out with *T. gambiense*, the blood and extracts of the organs of three out of seven puppies proved infective for mice. Microscopic examination of the milk was negative, but one mouse inoculated with it became infected.

Every care was taken to exclude the possibility of the puppies becoming infected by blood from small wounds on the teats.

(142) Fiori (C.) & Delanoë (M. & Mme.). **Sur un cas de trypanosomiase constaté chez un cheval à Mazagan, Note Préliminaire.** [A Case of Trypanosomiasis discovered in a Horse at Mazagan. Preliminary Note.]—*Bull. Soc. Path. Exot.* 1915. July. Vol. 8. No. 7. pp. 503–515. With 1 plate, comprising 17 figs.

The case recorded in this paper was discovered in an eight-year-old stallion which, so far as could be ascertained, had never served a mare. The primary clinical symptoms were weakness and anaemia, with oedema of the parotid region extending upwards to the ear and two-thirds of the distance down the neck in the jugular furrow. The animal had a good appetite and there was no elevation of temperature. Subsequently, however, other symptoms which suggested trypanosomiasis made their appearance. There was marked emaciation and weakness of the hind quarters. Petechiae appeared on the mucous membranes which became infiltrated. Plaques were observed on the skin, and there was intermittent fever.

Immediately trypanosomiasis was suspected blood examinations were made, but for several days autoagglutination of the red cells only was observed. On the twelfth day trypanosomes were found in the blood in fairly large numbers.

All the parasites seen seemed to have a free flagellum, and in the living state although very active did not move about from place to place in the field.

The blood was examined daily for nearly two months, and trypanosomes were found on four occasions, their appearance coinciding with an elevation of temperature.

The trypanosome was found to be pathogenic for the white rat and mouse, sheep, dog, and rabbit, but according to the authors their experiments are of too recent date to deny the possibility that the last three species may make recoveries.

Pappenheim's method is preferred for the staining of the trypanosome to Giemsa. In specimens stained by this method the blepharoplast appears very small, although it is invariably present. The flagellum is thick and is thrown with the undulating membrane into two or three folds. The free extremity of the flagellum sometimes shows a slight thickening.

The nucleus is sometimes placed transversely in the body, and neither in the original horse nor in any of the experimentally infected animals were any posterior nuclear forms found.

Very distinct granules were present in the body, especially in the anterior half. The posterior end is almost always cut off squarely.

Apparently a rather small number of trypanosomes from the horse have been measured for it is said that the average length of 52 parasites was 26·3 microns. In 7 per cent. found in blood smears made from the horse the trypanosomes had either a very short free portion of the flagellum or there was none at all. The smallest trypanosome measured was 16·8 microns in length, and the longest 33 microns.

In the rat the trypanosomes appeared to be more motile than in the horse, and showed a greater degree of translation.

From the measurements of 36 trypanosomes from the rat it was seen that it was rather larger than in the horse. It was also observed that in the rat about 16 per cent. of the trypanosomes had no blepharoplast, and similar observations were made on parasites present in the blood of infected mice.

The blepharoplast was constantly present in trypanosomes found in the blood of experimentally infected dogs.

The authors believe that the trypanosome is that of debab, but think that immunity tests are required to settle the point. They believe that the infection is brought to Mazagan by camel caravans.

(143) Yakimoff (L.). **A propos de l'identification des trypanosomes russes.** [The Identification of the Russian Trypanosomes.]—*C. R. Soc. Biol.* 1915. June 11. Vol. 78. No. 10. pp. 303–306.

In this short paper the author describes some experiments in which the identity of the trypanosome causing dourine in Russia and of the parasite responsible for the same disease in Algeria was tested by means of cross immunity experiments carried out with sheep. The results indicated that the two parasites were identical.

Further experiments carried out on the same lines with trypanosomes isolated from donkeys and camels at Boukhara showed that these were also identical, and also that the dourine parasites and the Boukhara parasites were different from each other, and that both of these differed from *T. brucei* (Pasteur Institute strain).

(144) JAXIMOFF (W. J.). [? Yakimoff, W. L.] & WASSILEWSKY (W.). **Sur les changements ayant lieu dans le sang du cheval à la suite de l'infection avec le trypanosome des chameaux du Turkestan.** [The Changes occurring in the Blood of Horses inoculated with the Trypanosome of the Camel in Turkestan.]—*C. R. Soc. Biol.* 1915. June 11. Vol. 78. No. 10. pp. 309–312.

A foal inoculated subcutaneously with the Boukhara trypanosome died on the 81st day. During the course of the infection observations were carried out regarding the changes occurring in the blood.

It was found that the number of red corpuscles fell from eight and a half million to a little over two million by the 79th day of infection. Agglutination of the red cells, polychromatophilia, and the presence of normoblasts were also observed.

The haemoglobin content of the blood fell more than 40 per cent. In the early stages of the infection the loss of haemoglobin occurred more rapidly than the destruction of the red cells, but in the later stages these processes were reversed. Three stages were observed in the changes in the leucocytes.

In the first stage the relationship of the white corpuscles to the red was 1 to 840. In the second stage it was 1 to 1,240, and in the third stage 1 to 112. The latter was in part due to oligocythemia and in part to leucocytosis.

During the first few days the percentage of lymphocytes rose to about 70 per cent. and it remained at about this level with slight oscillations for some time. During the final stages of the infection it fell to 21 to 31 per cent.

The percentage of the polynuclears varied inversely as the percentage of the lymphocytes.

Arneth's formula.—During the first stage there was a temporary diminution of cells with two nuclei, the number with 3, 4 and 5 nuclei commenced to increase slightly. During the second stage the cells with 4, 5 and 6 nuclei decreased.

At the outset the leucocytolysis was represented by 5·5 per cent., but it reached a maximum of 36·3 per cent.

The alkalinity of the blood became sensibly diminished as the disease progressed.

(145) LAVERAN (A.). **Au sujet d'un *Trypanosoma gambiense* qui, conservé depuis 12 ans chez des animaux, est resté résistant au sérum humain.** [A Strain of *T. gambiense* which after being passed through Animals for a Period of 12 Years has not lost its Power of resisting the Action of Human Serum.]—*Bull. Soc. Path. Exot.* 1915. July. Vol. 8. No. 7. pp. 442–446.

The author records a small number of experiments in which the action of human serum was tested upon a strain of *T. gambiense* which had been kept running in animals, mainly guinea-pigs, for a period of twelve years. The results showed that the trypanosome had lost little or none of its power of resisting the destructive action of human serum.

(146) Yakimoff (W. L.). **A propos du *Trypanosoma Wrublewskyi*.**—*Bull. Soc. Path. Exot.* 1915. July. Vol. 8. No. 7. pp. 431–433.

In this note the author records his change of opinion regarding the identity of the above trypanosome, and states that it is identical with *T. theileri*.

(147) Kolmer (J. A.). **A Method of transmitting Known Numbers of Trypanosomes, with a Note on the Numeric Relation of Trypanosomes to Infection.**—*Jl. Infect. Dis.* 1915. July. Vol. 17. No. 1. pp. 79–94. With 1 fig.

The author's method of ascertaining the number of trypanosomes present in a volume of blood is practically the same as that adopted for the enumeration of the total leucocytes. It simply consists in diluting the blood with a liquid which will kill and stain the trypanosomes, and at the same time render the red corpuscles invisible. It is necessary to make a preliminary examination of the undiluted blood so as to get a rough idea of the number of trypanosomes present and thus permit of the calculation of a suitable dilution.

The diluting fluid has the following composition :—

Formalin (40 per cent)	2 cc.
Glacial acetic acid	2 cc.
Distilled water	96 cc.

To these are added after mixing 2 cc. of carbol-fuchsin (Ziehl-Neelsen).

From experiments carried out with rats the author concludes that the injection of a small number of pathogenic trypanosomes lengthens the period of incubation and, in this manner, the duration of life, as dating from the time of infection ; but, when the parasites once appear in the peripheral blood, the duration of life is about the same, regardless of whether the animal was originally infected with a large or a small number.

(148) Yorke (W.) & Blacklock (B.). **The Reservoir of the Human Trypanosome in Sierra Leone.**—*Ann. Trop. Med. & Parasit.* 1915. July 3. Vol. 9. No. 3. pp. 383–390.

No special effort was made by the authors to ascertain the extent to which sleeping sickness occurred among the natives, but two cases were introduced to their notice.

The first case was a woman who had been infected for at least a year, during which period there had been no definite changes in the state of her health. One of two rats inoculated from her became infected. The other case was the son of the same woman. A single trypanosome had been seen in his blood, but two rats inoculated from him failed to become infected.

It would appear that the disease in Sierra Leone is a very chronic one, and the question of the reservoir is therefore of great importance. The authors have shown that in South Central Africa where trypanosomiasis in man is an acute condition, antelope form a more reliable source of infection for the fly than man, in view of the fact that they

are able to harbour the parasite for a long time in their blood without showing symptoms, and also that their distribution coincides with that of *G. morsitans*, that is to say, it is ubiquitous.

In West Africa, where the disease in man is chronic, and where the transmitting fly is *G. palpalis* which is limited much more closely to the haunts of man, it is probable that man is a more important reservoir than large game. But a trypanosome having all the morphological characters of the trypanosome isolated from the human cases was obtained from the blood of an ox. When maintained in rats and guinea-pigs it was seen that the trypanosome closely resembled *T. gambiense* in its behaviour as well as in its morphological characters, and the authors are of the opinion that it was *T. gambiense*.

Before any opinion can be formed as to the relative importance of man or domestic stock as reservoirs for the infection of the fly information must be gained as to the course of the infection in the animals, and the percentage of them infected.

These points will present some difficulty, but in connection with the first of them it is noted that after an interval of four months the ox did not appear to show any indication of disease. If, as it appears from this, it should prove that the domestic stock are tolerant of infection with the trypanosome the task of discovering the percentage of animals infected will be much greater. It is also pointed out that when prophylactic measures are contemplated the existence of a potential reservoir in domestic stock will have to be taken into consideration.

(149) da Costa (B. F.), Correia dos Santos (A.), Firmino Sant'anna (J.) & de Araujo Alvares (M. G.). **Relatorio final da missão da doença do sôno da ilha do Principe (1912-1914).** (Parte V. Estudo sobre as tripanosomiases da Ilha do Principe. [A Study of the Trypanosomes of the Island of Principe] by Sant'anna (J. Firmino.)—*Arquivos de Hig. e Patol. Exot.* 1915. Mar. 30. Vol. 5. pp. 181–256. With 5 plates, 2 figs. & 10 charts.

This is the concluding portion of the final report of Portuguese Sleeping Sickness Commission for the Island of Principe, of which the first part was noticed in Vol. 6 of the *Tropical Diseases Bulletin*, p. 166.

The author only arrived in the island towards the conclusion of the measures taken to exterminate the disease, so that pathological material was scanty and hard to obtain. Particulars are given of the characteristics of four strains of *T. congolense* isolated from three different oxen and a mule, and of one strain of *T. uniforme* from an ox. From three human patients one strain of *T. gambiense* was isolated. Coloured illustrations are given of the morphological peculiarities of all these strains. The four races of *T. congolense* merely varied in their infectivity for animals, their structural characteristics being the same. As shown in a chart (p. 196 of the report) the mean length of all four strains was 15 microns, with extremes ranging from 8 to 21 microns. No. 1 strain was inoculable into all the animals tried, namely rats, guinea-pigs, rabbits, monkeys, dogs and goats; and in rats, guinea-pigs and dogs the infection followed an acutely fatal course, while a monkey and a goat recovered. Inoculation into a cat proved negative.

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With No. 2 strain only slight infections were obtained with all the above animals, and with rats and guinea-pigs only after passage through a monkey. No. 3 was inoculable into rats and rabbits, while dogs proved refractory, and with No. 4 only a very light infection was obtained in rabbits and rats.

The single specimen of *T. uniforme* was obtained from an ox that had been eight years on the island and had been originally imported from Cape Verde. Its mean length (chart on p. 205) was 15 microns, with extremes of 11 and 22 microns. The only animals successfully inoculated with it were goats and sheep; one goat dying after 15 days' illness, and one sheep after 19 days. Both animals were at the time badly affected with scab. Laboratory animals proved refractory.

Three examples of *T. gambiense* were obtained from human subjects. Only a few inoculations were made into animals. A strain passed through a monkey had a mean length of 20 microns, whilst the curve of a second strain showed a double peak at 20 and 27 microns (chart p. 222).

A few notes are added as to the blood-sucking insects of Principe. The Glossinae were nearly all destroyed; 342 specimens were, however, dissected, of which number 4·6 per cent. showed flagellates in the mid and hind gut. All attempts in the laboratory to procure infection with these flies in rabbits and monkeys failed. The colour of the Glossinae was exceptionally dark. The island contains two species of Tabanus, *congolensis* and *taeniola*. A Herpetomonas, apparently a new species, was plentiful in the hind gut and rectal ampulla of both species, and is figured and described (Plate V). No name is proposed for it. *Stomoxys nigra* is exceedingly plentiful and is a great affliction to horses and cattle. About 4 per cent. of these insects contained another Herpetomonas (figured in Plate V).

The Culicinae obtained on the island comprised *Toxorhynchites* (? sp. nov.), *Culiciomyia nebulosa, Banksinella luteo-lateralis, Stegomyia fasciata, Anopheles costalis* and *Culicoides milnei*, the latter a very troublesome pest.*

(150) Wehrbein (H.). **Conglutination in the Diagnosis of Dourine (Trypanosomiasis of the Horse.)**—*Jl. Infect. Dis.* 1915. May. Vol. 16. No. 3. pp. 461–465.

The author gives details of the technique adopted in carrying out the tests and summarises the results given by 19 positive sera and 30 negative sera. The general conclusion drawn is that although the method can be used, it is more liable to error through faulty technique and more difficult to carry out than the complement-fixation test.

(151) Laveran (A.). **Sur les variétés acentrosomiques artificielles des Trypanosomes.** [The Acentrosomic Varieties of Trypanosomes artificially produced.]—*C. R. Acad. Sci.* 1915. Vol. 160. p. 543.

In collaboration with Roudsky the author has recently investigated the effects produced by trypasafrol upon the centrosomes of trypanosomes.

* Summarised by Dr. J. B. Nias.

In mice infected with *T. brucei* and treated with the drug in doses of 0·5 to 1·0 mg. per 20 g. body weight the centrosome entirely disappeared at the 16th passage, and this change persisted in subsequent passages although no treatment was given.

With *T. soudanense*, *T. gambiense*, and *T. rhodesiense* incomplete results were obtained, while *T. lewisi* and *T. duttoni* resisted the action of the drug.

A strain of *T. evansi* has been passed through 459 mice without regaining the centrosome.

The acentrosomic varieties appear to be less virulent than the normal trypanosomes, and the author suggests the possibility of using such varieties for the protective inoculation of animals against the ordinary strains.

(152) Dubois (A.) & van den Branden (F.). **La réaction de Boveri dans le Trypanosomiase humaine.** [Boveri's Reaction in Human Trypanosomiasis.]—*Bull. Soc. Path. Exot.* 1915. May. Vol. 8. No. 5. pp. 261–266.

Conclusions :—

1. Boveri's reaction ordinarily occurs in trypanosomiasis during the nervous stage of the disease.
2. It is usually absent or slight in the earliest stage of infection.
3. Boveri's reaction appears to be attributable to protein substances and possibly to them alone.

(153) Jones (H. Ll.). **The Treatment of Trypanosomiasis in Cattle caused by the *Trypanosoma pecorum*.**—*Jl. Comp. Path. & Therapeutics.* 1915. June. Vol. 28. No. 2. pp. 154–166. With 1 map.

In carrying out the first set of observations detailed in this paper the author was working under very unfavourable conditions as the animals were 30 miles from his headquarters, and he had no assistance other than that afforded by untrained natives. The data, in consequence, are not complete, but information of considerable value is afforded by them.

The animals on the rubber and sugar estate where the disease occurred comprised 40 working oxen, 5 donkeys, 4 mules, 1 horse, and 13 goats, and the disease had been in existence for at least three years. In spite of every effort being made no Glossinae were ever captured on the estate, and it would appear that the disease was introduced by cattle brought from another part of the territory, although the origin of the infection of these animals was never discovered. Among the flies caught were a number of different species of Tabanidae, Haematopota, Stomoxys, and one species of Hippobosca.

Diagnosis was based upon the examination of fresh blood smears and specimens stained with Giemsa, and it was found that 20 cattle, 3 donkeys, 1 mule, and 1 horse were infected. Five cattle had died, showing symptoms strongly suggestive of trypanosomiasis.

It was decided to treat the sick oxen only, but before this could be arranged four of them had died, and the infected mule had been killed.

Prior to the commencement of treatment the temperatures of the isolated cattle were taken twice daily, and it was noted that the evening temperature was almost invariably higher than the morning temperature.

The first treatment adopted was the intravenous injection of an average dose of 1 gramme of antimony potassium tartrate dissolved in 20 cc. of boiled water and allowed to cool to the body temperature. On taking the animals' temperatures on the five days following the injections it was found that there was a considerable improvement both as regards the height of the morning temperature and the difference in the two daily readings.

Blood examinations were carried out four hours, 24 hours, and five days after the injections, and in every instance the result was negative. There was also observed a general improvement in the condition of the animals.

The second part of the treatment consisted of giving on alternate days for a period of three weeks increasing doses of arsenic. During the first week the animals received 1 gramme, during the second week, 1·5 g. and during the third week 2 g. The drug was administered either wrapped in paper and given by hand, or mixed with chopped grass and mealie meal. No toxic symptoms were ever observed. After an interval of three weeks the treatment with arsenic was repeated. It had been intended to give another injection of emetic, but the author was unable to go to the estate.

Two and a half months after the first treatment a second visit was paid. Examination of the blood of all the animals revealed the presence of very small numbers of granular trypanosomes in three of them. At this date the whole of the treatment was recommenced.

About three weeks after four of the animals had trypanosomes in their blood. In two they were numerous and in two scanty. Two of those which had shown granular trypanosomes on the previous occasion were negative at this test. In spite of this the condition of all the animals was satisfactory, and 50 per cent. of them were fat.

A fortnight later those animals which had not shown trypanosomes were put to work, working half a day for a week and then resting for a week, and for a month this programme was followed.

After a further interval of about a fortnight another blood examination was made and trypanosomes were found in two animals which had shown them at the previous test.

During the two following months the animals, except for the two infected ones, did their half-day's work regularly. The two infected animals received a course of arsenic. Three months later no trypanosomes could be found in any of the treated animals.

Of the 20 oxen not treated four died with typical symptoms, and it is quite possible that these and perhaps other animals were actually infected at the time of the first examination, but escaped detection. Eventually seventeen of them died, and they thus served usefully as controls.

Two years and nine months after the first treatment the whole of the sixteen surviving animals which had been treated were still working and had been doing so the whole time.

In February, 1913 an outbreak occurred in the neighbourhood of Beira in which over 1,000 animals died within six months.

Treatment was carried out on the same lines as in the previous outbreak on 498 infected animals. Within six weeks after the commencement of the treatment 49 animals had died. The second injection was given about two months after the first, and as it appeared to be a case of kill or cure the doses were doubled. The animals were in such poor condition that 16 died within a day as a result of the injection. By the end of September, about four months after the treatment had been started, the herd numbered 309 animals, but many were still showing marked clinical symptoms. Forty-five of these received a fresh injection but no more arsenic, with resulting improvement in their condition.

Early the following year 95 bullocks were sold in fat condition, but during the course of the year seven or eight animals were killed as they appeared to have failed to make a recovery, and were a source of danger.

At the beginning of the following year there were 157 animals in the herd and all looked perfectly healthy. A number of animals had been disposed of during the interval, but no deaths had occurred.

A small number of experiments carried out with arsenophenylglycin gave very unsatisfactory results. The dose used was 1 gramme per hundredweight dissolved in 1 litre of warm distilled water, and it was administered intravenously. Three injections were given with intervals of five and eight weeks, but although there was a rapid disappearance of the trypanosomes from the blood they always reappeared.

Eight animals were treated with soamin, animals weighing half a ton were given as much as 120 grains dissolved in 30 cc. of distilled water and injected subcutaneously. Large single doses were found to be preferable to small repeated doses. Seven cattle and a donkey were submitted to the treatment, and none died. The cattle improved very greatly in condition, but the donkey remained weak. An objection to this treatment was the expense.

The author gives an outline of the sequence of events in the various outbreaks and the circumstances lead him to think that Glossinae were not responsible for the transmission of the infection from herd to herd, because none could be found, in spite of a long continued search on the flats where the animals were principally pastured and where they came into close contact with each other. *G. morsitans* was found in outlying forest land. He believes that Tabanidae and Hippoboscidae were concerned in the spread of the disease, as flies of these genera were present, sick and dying animals being literally covered with them.

Certain conditions are however necessary for the transmission. The animals must be in very close contact with each other, and there must be very large numbers of the various biting flies. The author believes that the transmission is a mechanical one.

(154) van Saceghem (R.). **Expériences sur le traitement des trypanosomiases animales.** [Experiments regarding the Treatment of Animal Trypanosomiases.]—*Bull. Soc. Path. Exot.* 1915. May. Vol. 8. No. 5. pp. 339–347.

The experiments recorded in this paper were carried out at the School of Tropical Medicine at Brussels, and the drugs used were

atoxyl and emetic, either alone or in conjunction with each other. The two strains of trypanosomes utilised in the experiments were *T. congolense* and *T. brucei* var. Uganda. The experiments were carried out almost exclusively with guinea-pigs.

The general results obtained indicate that subcutaneous injections of either of the drugs mentioned are of no value for the treatment of guinea-pigs infected with *T. brucei* or *T. congolense.*

Rather better results are claimed for treatments involving the use of atoxyl and emetic together.

In view of the irritant effect produced by emetic when injected under the skin of large animals, and the difficulties associated with its intravenous injection, the author recommends the intramuscular method for the administration of this drug. It is said that with this method there may be produced weakness, acceleration of the pulse, and other symptoms of lowered vitality; these, however, pass off within 24 hours.

When the drugs are used in conjunction with each other they should be administered separately.

The author thinks that relapses are due rather to trypanosomes in certain parts of the body, such as the bone marrow, escaping the action of the drugs than to specially resistant forms, and proposes to overcome the difficulty of reaching them by administering very large doses, and to counteract the systematic effects of these doses by administering atropine sulphate or caffeine.

In an appendix the author gives brief details of one case of trypanosomiasis in a buffalo (*T. cazalboui*) at Zambi which was treated by intramuscular injections of emetic associated with subcutaneous injections of atoxyl and improved greatly in condition.

LEISHMANIASIS.

(155) YAKIMOFF (W. L.). **Contribution à l'étude des Leishmanioses de l'homme et du chien dans le Turkestan russe.** [Human and Canine Leishmaniasis in Russian Turkestan.]—*Bull. Soc. Path. Exot.* 1915. July. Vol. 8. No. 7. pp. 474–503.

The author finds that in Turkestan there appears to be some connection between the number of cases of the disease occurring in the dog and in man in the various districts, the percentage of cases in the two species bearing a more or less constant relation to each other.

Of twelve cases of the disease in children in which the author was especially interested seven were in close contact with dogs, one with a cat, in one dogs were in the neighbourhood of the child, but there was no actual contact, and in three there were no dogs in the house.

In smears of the intestinal contents of a flea caught on the cat the author has found organisms in the post-flagellate phase similar to those noted by BASILE, SANGIORGI and others, and in *Ctenocephalus canis* he has found parasites indistinguishable from leisbmania.

The parasite occurring in Turkestan is indistinguishable from the Indian and Mediterranean parasites, and like those it may be either free or enclosed in cells of various kinds. On one occasion in a child the author found a leishmania in a red corpuscle.

An observation made in 1912 on material obtained from Tunis but not published has been confirmed in Turkestan, namely, that forms suggesting, if not representing, schizogony may be found both free and enclosed in cells in smears made from the spleen in severe cases.

The author has been able to infect mice from children and to infect dogs and cats from such mice.

With regard to the question as to the identity or otherwise of the diseases caused by parasites of this genus in the various countries, the opinion is expressed that they are all identical, and that the diseases of man and the dog are also the same. In consequence of this dogs may play an important part in the transmission of the disease, and contact with dogs is always a source of danger to man.

Material has been obtained from about 1,000 dogs, and examination shows that practically 24 per cent. are infected, and it appears to be established that the disease in dogs shows a seasonal variation, the number of fresh infections increasing during the early part of the summer.

An account is given of the clinical characters of the disease in dogs, but the author expresses the view that in the majority of cases no special symptoms are seen. It was found experimentally that the disease may last for three years or more.

The most constant lesions were enlargement of the spleen and red colouration of the bone marrow, but both of these lesions are not observed in every case, and enlargement of the spleen alone is not very significant.

(156) Laveran (A.). **Sur une culture de *Leishmania donovani* souillée par un champignon.** [A Culture of *Leishmania donovani* contaminated by a Mould.]—*Bull. Soc. Path. Exot.* 1915. July. Vol. 8. No. 7. p. 429.

The author records that some tubes of simplified Novy medium sown out with *L. donovani* gave good growths in spite of the presence of a mould. The contamination was got rid of by placing in the tubes five drops of a 1 per cent. solution of caustic soda. Four days later the moulds had disappeared, and on subcultures being made the leishmania was obtained in a state of purity.

(157) Laveran (A.). **Nouvelle contribution à l'étude des infections expérimentales de la souris par la *Leishmania tropica*.** [Further Contribution regarding the Experimental Infection of the Mouse with *Leishmania tropica*.]—*Bull. Soc. Path. Exot.* 1915. June. Vol. 8. No. 6. pp. 363–369.

In this paper the author records the results of his examinations of sections of the testicles of mice inoculated with *L. tropica*. From these it appears that the epithelium of the testicles is never involved, but that the connective tissue surrounding the testicle which is at the same time infiltrated with embryonic cells contains the parasite in large numbers. In advanced cases the testicular substance may be invaded by connective tissue containing the parasite, and this may lead to atrophy of the organ.

The author again draws attention to the development of small superficial abscesses containing Leishmania on the abdominal wall of mice inoculated into the peritoneum, and makes special mention of one case in which there was developed a periarthritis of the joints of the hind legs. This mouse showed at the same time a septicaemia following on partial necrosis of the lesion of the testicles.

(158) YAKIMOFF (W. L.). **De la période d'incubation chez les animaux infectés par les *Leishmania*.** [The Period of Incubation in Animals infected with Leishmania.]—*Bull. Soc. Path. Exot.* 1915. July. Vol. 8. No. 7. pp. 430–431.

Summarising briefly the statements published by various observers, the author shows that in dogs the period of incubation after experimental infection is generally about 12 days, and that in mice the period may be very short.

A dog of about two months old was inoculated intraperitoneally with an emulsion of the organs of another dog which had been infected with a human strain of the parasite which had been used to infect mice successfully. The material used was very rich in parasites. On the third day the dog died. The serous membrane of the small intestine was very congested and parasites were found in small numbers in smears from the liver and the spleen. The bone marrow appeared to be free from parasites.

It is suggested that the short period of incubation in this case may have depended to some extent upon the number of parasites injected, the age of the animal inoculated, and the origin of the virus.

SPIROCHAETOSIS.

(159) ZINSSER (H.) & HOPKINS (J. G.). **Antibody Formation against *Treponema pallidum*—Agglutination.**—*Jl. Experim. Med.* 1915. June. Vol. 21. No. 6. pp. 576–583. With 3 plates comprising 5 figs.

Summary:—

"It has been shown by our experiments that the serum of rabbits treated with emulsions of *Treponema pallidum* contains agglutinating substances.

"Normal rabbit serum also possesses agglutinating power for this organism, but, as in the case of normal bacterial agglutinins, to an extent very much inferior to that possessed by the sera of immunized animals. Normal human sera will agglutinate similar pallidum emulsions, as will the sera of certain syphilitic patients with positive Wassermann reactions. Whether or not there is a quantitative difference of diagnostic value between the sera of normal human beings and those of syphilitics remains to be seen.

"The sera of rabbits immunized with strain A agglutinate Noguchi's strain 9 in dilutions as high as 1 to 500.

"We regard as the most important result of these experiments the demonstration of definite antibodies in the circulation of animals treated with dead emulsions of *Treponema pallidum*. Since it is our belief* that

* ZINSSER (H.). *Jl. Experim. Med.*, 1913. Vol. 18, p. 219.

the agglutinating effect is due to an antibody essentially the same as that which produces bactericidal, precipitating, and opsonic effects, *i.e.*, that there is probably one type of antibody only, we believe that the demonstration of agglutinins establishes the fact that in syphilis as in bacterial diseases the host responds by the formation of antibodies or sensitizers specific for the treponema.

"Spirocheticidal experiments with these sera, both *in vitro* and *in vivo*, are in progress."

(160) Launoy (L.) & Lévy-Bruhl (M.). **Sur la résistance des poules à l'infection par la *Spirochaeta gallinarum* après thyroïdectomie ou splénectomie.** [The Resistance offered by Fowls to Infection by *Spirochaeta gallinarum* after Thyroidectomy and Splenectomy.]—*Ann. Inst. Pasteur.* 1915. May. Vol. 29. No. 5. pp. 213–220.

The fact that enlargement of the thyroid glands and of the spleen is observed in both natural and experimental spirochaetosis in birds prompted the authors to investigate the question as to whether these organs play any part in the resistance offered by birds to infection, and in the production of antibodies, and whether their removal would alter the course of the disease in any way.

A number of series of experiments in connection with removal of the thyroid glands are briefly recorded. From these it appears that removal of the thyroids does not reduce the degree of resistance offered by birds to infection, when the attempt to infect is made from one to 16 days after the operation. Partial or complete removal of the parathyroids also appeared to have no effect.

It was further shown that the protective power possessed by the serum of recovered birds from which the glands had been removed was not lowered in any way.

In birds from which the spleen had been removed prior to their inoculation it was found that spirochaetes appeared in the blood earlier than in the controls, and also that parasites were far more numerous in the blood of birds that had been operated upon. A further fact that was established is that the duration of the invasion of the blood is longer than in birds not derived of their spleens. These phenomena are not accompanied by any increase in the severity of the clinical manifestations of the infection, in fact the symptoms are often less severe in animals upon which splenectomy has been performed.

Removal of the spleen does not affect the production of protective substances.

PROTOZOA.

(161) Lawson (Mary R.). **Adult Tertian Malarial Parasites attached to Peripheral Corpuscular Mounds. The Extracellular Relation of the Parasites to the Red Corpuscles.**—*Jl. Experim. Med.* 1915. June. Vol. 21. No. 6. pp. 584–592. With 4 plates comprising 109 figs.

In this paper the author repeats her views regarding the position of the malarial parasites in relation to the red corpuscles, and a large number of figures taken from photographs of stained preparations are reproduced to support the view.

(162) Perekropoff (G. J.). **Ueber Kulturen der Plasmodien des tropischen Fiebers (Malaria tropica).** [The Cultivation of the Plasmodium of Tropical Malaria.]—*Arch. f. Protistenk.* 1914. Nov. 3. Vol. 35. No. 2. pp. 139–153. With 3 coloured plates comprising 116 figs.

The author claims that by a technique based upon that of Bass and Johns he has been able in two cases out of seven to obtain not only schizogony but also sporogony with the development of sporocysts in the red corpuscles. The modifications of Bass and Johns' method adopted are as follows :—

1. The quantity of dextrose solution added to the blood was 0·4 cc. to 10 cc.
2. The "blood serum" was inactivated by heating it to 41° C. for half an hour and then for a similar period to 42° C.
3. For transplantations "blood serum" inactivated at 55°–56° C. was used.
4. The transplantations were made 5 or 6 hours after the normal segmentation had taken place.
5. The material was transferred to a rich medium composed of 0·04 cc. of 50 per cent. dextrose or maltose solution and 0·2–0·4 cc. of "blood serum" or Loeke's solution.
6. The proportion of red corpuscles containing parasites to fresh red corpuscles was as 2 : 5 to 3 : 5.
7. The blood containing the parasites was not centrifuged in any instance ; thus injury to the parasites was avoided.

(163) Mathis (C.) & Heymann (P.). **La réaction de Wassermann dans le paludisme.** [Wassermann's Reaction in Malaria.]—*Bull. Soc. Path. Exot.* 1915. May. Vol. 8. No. 5. pp. 258–259.

The authors have tested serum from 21 cases of malaria of different types, but have not obtained positive results in any instance.

(164) Wenyon (C. M.). **The Pigmented Parasites of Cold-Blooded Animals, with some Notes on a Plasmodium of the Trinidad Iguana.**—*Jl. Trop. Med. & Hyg.* 1915. June 15. Vol. 18. No. 12. pp. 133–140. With 1 plate comprising 16 figs.

The first portion of this paper contains a short history of the discovery of pigmented parasites of cold-blooded animals. The author then passes on to a consideration of the classification of these parasites and concludes that the organisms should be placed in two genera according as gametocytes and schizonts or gametocytes alone are to be found in the peripheral blood, as is the case with the malarial parasites of birds.

A brief description of the various parasites that have been found in the red blood corpuscles of cold-blooded animals is given. This includes six parasites found in the blood of lizards, all of which belong to the genus Plasmodium, and five species from tortoises belonging to the genus Haemoproteus. It is doubtful whether these are all distinct species. A description is also given of two parasites belonging to the genus Haemoproteus which have been found in the blood of snakes. It is probable that these belong to a single species.

The paper also contains a description of a parasite found in films of blood made from the Trinidad iguana. The plate shows young forms, schizonts in different stages of division, and parasites that are considered to be gametocytes. In view of the occurrence of these forms in the blood the parasite must be considered to be related to the genus Plasmodium.

(165) Yorke (W.) & Blacklock (B.). **Notes on Certain Animal Parasites of Domestic Stock in Sierra Leone.**—*Ann. Trop. Med. & Parasit.* 1915. July 31. Vol. 9. No. 3. pp. 413–420.

The authors examined 143 head of cattle and found trypanosomes in 19, but the number actually infected was probably much higher than this as in most cases an examination of a single preparation of fresh blood was all that could be done. The bulk of the infected animals were found among those brought down to Freetown for slaughter. The probable explanation of this fact was that the natives brought in the animals for slaughter when it was observed that they were losing condition. The following trypanosomes were found: *T. congolense* eleven times, *T. vivax* twice, a double infection of these two five times, and *T. gambiense* once.

The blood of ten dogs was examined with negative results, but one of the animals was proved to be infected with *T. congolense* by the inoculation of rats.

No trypanosomes were found in the blood of seven sheep and seven goats.

Four hundred specimens of *Glossina palpalis* caught on Cape Lighthouse Peninsula were examined and trypanosomes were found in twenty-one of them. In no instance were the salivary glands infected, but from the distribution of the infection in the flies it would appear that fifteen were infected with *T. vivax*, four with *T. congolense*, and the remaining two with a trypanosome belonging to the *congolense* or *gambiense* group. This point could not be settled as the development of the trypanosomes in the flies was not complete.

In about 5 per cent. of the animals examined parasites which were undoubtedly *Babesia bigeminum* were discovered. In from 20 to 30 per cent. of the animals another parasite was present in the red blood corpuscles, and this the authors think there can be no doubt was *Theileria mutans*. In some of the animals 1 to 2 per cent. of the corpuscles were invaded, while in others only an odd parasite could be found. No "blue bodies" were found in the blood or in smears from the organs of six infected animals.

The only species of ticks encountered were *Boophilus australis* and *Amblyomma variegatum*.

(166) Fantham (H. B.). **Insect Flagellates and the Evolution of Disease, with Remarks on the Importance of Comparative Methods in Study of Protozoology.**—*Ann. Trop. Med. & Parasit.* 1915. June 30. Vol. 9. No. 2. pp. 335–348.

"The significance of the herpetomonad stage of *Leishmania*, of the recent announcements that such stages occur in man, and of the presence of natural herpetomonads in other vertebrates (for example, mice), are discussed. It also recalled that insect herpetomonads can invade and live in plant-tissues.

"The experiments on the introduction into different vertebrates of various species of *Herpetomonas* and *Crithidia* parasitic in insects by Laveran and Franchini, using mammals, and by Fantham and Porter, using both warm- and cold-blooded vertebrates, are summarised and discussed.

"It is inferred that the various leishmaniases are due to a herpetomonad of invertebrates which, under different conditions of environment, produces pathogenic effects in very varying degrees in different vertebrates, from zero, as in the mice described by Dutton and Todd in 1903, to high mortality as in Indian kala-azar, and probably zero again in cold-blooded hosts. It is also a flagellate which can probably live in invertebrates not already recorded as being infected. A human reservoir of leishmaniasis may occur in some places, while warm- and cold-blooded vertebrates may also function as the same.

"It is highly probable that the so-called cultural herpetomonad stages of trypanosomes were really cultures of scanty herpetomonad infections co-existing with trypanosome infections."

(167) Fantham (H. B.) & Porter (Annie). **On the Natural Occurrence of Herpetomonads (Leptomonads) in Mice.**—*Parasitology.* 1915. June. Vol. 8. No. 1. pp. 128–132. With 7 text-figs.

The authors refer to some observations regarding the occurrence of herpetomonads in the blood of mice which were originally made by them in 1909, and which were repeated in 1911 and 1912.

A description of the parasite is given and the original statement by Dutton and Todd regarding the occurrence of parasites of this genus in the blood of mice in the Gambia is reproduced in full.

The conclusions drawn are as follows:—

"1. Natural herpetomonads (or leptomonads) occur in mice.

"2. The origin of the infection is to be sought in a flagellate of an ectoparasite of the mouse. This flagellate is very probably *Herpetomonas pattoni*, a natural or specific parasite of fleas (especially rat fleas), which protozoön can adapt itself to life in the blood of mice.

"3. Herpetomonads have been recorded from rat fleas, dog fleas and human fleas. Probably the flagellates are varieties of one species, *H. pattoni*, which can live in the blood and certain internal organs of rats, mice, dogs, and man."

(168) Rodhain (J.). **Herpetomonas Parasites de larves d'Oestrides cavicoles.** [Herpetomonas Parasitic in Larvae of Oestridae.]—*Bull. Soc. Path. Exot.* 1915. June. Vol. 8. No. 6. pp. 369-372. With 8 text figs.

A. Herpetomonas of larvae from *Bubalis lelwel jacksoni*. These are large lancet-shaped parasites which have a thick flagellum projecting from the anterior extremity of the body, and in the fresh state are capable of active movement. The nucleus is centrally placed and round or oval in shape. When undergoing division it appears to be composed of a number of chromatic granules. Anterior to the nucleus there is a large oval blepharoplast. The flagellum starts at a small but distinct basal granule placed anterior to or beside the blepharoplast. The first portion of the flagellum is formed by a thick rhizoplast and this is succeeded by the flagellum proper which is covered by a thin periplastic membrane. Even in the resting condition the flagellum is invariably double, and during the process of division two distinct double flagella can often be seen.

In the cytoplasm very slender axostyles can be seen extending from the basal granules to the posterior somewhat pointed extremity of the body. These appear to intercross in front of and behind the nucleus.

The parasites measure from 60 to 90 microns in length including the flagellum, and from 3·6 to 6·25 in width.

The parasite has only been found in the intestinal contents of the larvae, but it has been found in all five species of oestruus larvae occurring in the sinuses of Bubalis. No true cyst forms have been seen, nor has the parasite been found in the adult fly.

B. Herpetomonas of the larvae of *Rhinoestruus nirvaleti*, Rodh. and Beq. in *Potamochaerus porcus*. Six larvae were obtained and all were infected. The herpetomonas was very similar to that just described, but it was rather smaller and the double flagellum of the adult forms was rather less distinct. Encysted forms of this species were also observed. In these the blepharoplast was placed very close to the nucleus and was possibly fused with it, while the flagellum was reduced to its intracytoplasmic part.

(169) Laveran (A.) & Franchini (G.). **Au sujet d'un Herpetomonas de *Ctenopsylla musculi* et de sa culture.** [A Herpetomonas of *Ctenopsylla musculi* and its Cultivation.]—*Bull. Soc. Path. Exot.* 1915. May. Vol. 8. No. 5. pp. 266–270.

The parasite referred to occurs in the following forms in smears of the intestinal contents of the mouse flea stained with Giemsa. The commonest form is the leishmaniform parasite which measures from 2 to 4 microns in length by 1 micron in width. They are oval and generally possess a centrosome and a nucleus.

There also occur larger forms which measure from 5 to 15 microns in length by 1·5 to 2 in width. These have one rounded extremity and one pointed. The centrosome is placed towards the rounded end, but may be quite close to the nucleus. These parasites appear to be a more advanced stage of those first described.

Large rosette clumps are frequently seen.

The other form in which the parasite occurs closely resembles the preceding one, but there is a short flagellum which takes origin at the centrosome and passes out of the body at the rounded end. Parasites of this type are exceedingly rare.

Encysted forms have never been found in the faeces.

A positive result was obtained in one culture tube out of six, the medium being rabbit blood-agar, incubated at 25–26° C.

In cultures, as in the intestinal contents, leishmaniform parasites are by far the more numerous, flagellated organisms being distinctly rare. The morphology of the parasites in culture resembled that of the intestinal forms, but as a rule they appeared to be considerably larger.

(170) Schultz (C. H.). **Coccidiosis in Cattle and Carabaos.**—*Jl. Infect. Dis.* 1915. July. Vol 17. No. 1. pp. 95–108.

In carrying out rinderpest investigations the author encountered a number of "irregular cases" which eventually proved to be cases of coccidiosis, or as the author prefers to call it coccidian gastro-enteritis.

Great emphasis is laid upon the difficulty of differentiating coccidiosis from rinderpest, and in the paper the information regarding the two diseases is somewhat curiously intermixed.

The author states that in one case of coccidiosis which showed lesions at the post-mortem identical with those of rinderpest, "young forms of the schizogonous type could be found in countless numbers in scrapings from the ulcerated abomasum" and the whole of the intestinal tract.

He also states that by careful laking and centrifugation of blood taken from an animal recovering from a severe attack of coccidian dysentery spores can be obtained in appreciable numbers. It is said that coccidia can be found more easily in the urine than in the faeces, and that in the urine they appear under the immersion lens as "dense small coccoid bodies," the larger forms "being apparently held back by the kidneys."

"When spores are first liberated they are quite large, about one-half the size of an erythrocyte. As the spores become more developed, they show a denser capsule and become smaller."

The author states that from his "own observations in rinderpest experiments it would appear, in view of the peculiar methods by which coccidia can be divided into most minute organisms (Zublein, 1908), that one part of their life-cycle is passed in the blood vascular system, and that their rapid multiplication in most minute forms produces the haemolytic form of the disease. This is superseded, if the host lives, by the diarrheal form, the latter being necessary to re-infect other hosts and to transfer the contagion from one place to another. . . . . .

"We cannot deny that acute coccidiosis has invariably resulted from rinderpest inoculations. Our last cases (3,694 and 3,714) died from coccidian gastro-enteritis of the most severe type after receiving a subcutaneous injection of 5 cc. of rinderpest blood. Since we have been able to recognise coccidiosis, we have never found a case of rinderpest without the presence of these organisms in great numbers. . . . .

"Of four guinea-pigs that were inoculated with blood from spore-bearing cattle, two died [about 7 weeks later] from coccidian dysentery, one died from pneumonia, and one is still alive and doing well. . . . .

"A good illustration of nature's method of producing immunity against protozoa is found in our southern states, where cattle, inoculated by ticks with piroplasmosis for generations, have acquired a very high resistance."

(171) Wickware (A. B.). **Is *Leucocytozoon anatis* the Cause of a New Disease in Ducks?**—*Parasitology.* 1915. June. Vol. 8. No. 1. pp. 17–21. With 3 plates.

The disease in question runs a rapid and fatal course, about 70 per cent. of the affected birds succumbing. The first symptom is an impaired appetite, but the preliminary symptoms are not very marked.

In some cases the birds succumb during the first paroxysm, while in others there are exacerbations at intervals without producing a fatal result.

One of the attitudes taken up by the birds when in a comatose condition is with the head bent over backwards and resting on the back. If birds in this condition are roused they show evidence of intense excitement. The power of balance is lost, and they roll over and over, and the head is waved about in an extraordinary manner. In some cases the neck is turned completely round, the head resting on the ground in an upright position. A fairly constant symptom

is a purulent ophthalmia. Recovered birds are very stunted in their growth.

The causal agent of the disease has not been determined, but in the course of his investigations the author discovered a leucocytozoon which does not appear to have been described before, and which is the subject of this preliminary report.

Parasites were found in all the diseased ducks and they were present in smaller numbers in recovered birds. Contact birds which showed no symptoms were apparently not infected with the organism.

The predominant form was a spindle-shaped structure measuring 35 to 60 microns in length by 10 in width. There was an elongated or irregular-shaped nucleus, and a dark "chromatic band" running along one border of the parasite. Further study is required to settle definitely whether the organism is motile.

The only lesion found was acute haemorrhagic inflammation of the intestine immediately behind the caeca. There was constantly an increase in the number of eosinophile leucocytes in the blood.

A limited number of inoculation experiments were carried out. In one of these two gamete forms were observed on the seventh day after intraperitoneal inoculation with blood. In these parasites the chromatic band was present, but no nucleus could be discovered. Three days later typical gametes with nuclei were found. These forms persisted for a few days and then disappeared. No mature forms were present in the smears. White rats appeared to be refractory.

HELMINTHS.

(172) Yorke (W.) & Blacklock (B.). **Ankylostomiasis in Dogs in Sierra Leone. (Being the Fifth Report of the Thirty-second Expedition of the Liverpool School of Tropical Medicine, 1914-1915).** —*Ann. Trop. Med. & Parasit.* 1915. July 31. Vol. 9. No. 3. pp. 425–427. With 4 text-figs.

Of seven dogs examined by the authors all were found to be infected with ankylostomes, but two species of parasites were encountered—*Ankylostoma caninum* and *Ankylostoma ceylanicum*. These species are easily distinguished by the arrangement of the teeth. In the former there are three pairs of ventral teeth, and in the latter one large ventral pair and a second very small pair close to their base.

The rays of the lateral lobes of the caudal pouch are the same in the two species, but in the median ray of the dorsal lobe there is a slight difference. In both species the ray is bifurcated in the terminal third, each branch being tridigitate at the extremity. In *Ankylostoma caninum* the digitations are separated from each other by mere notches, while in *Ankylostoma ceylanicum* the outer notch is quite deep and cleft-like. The males measure about 6–7 mm. and the females from 7 to 14 mm.

No opportunity offered to ascertain whether *Ankylostoma ceylanicum* occurs in man in Sierra Leone.

(173) Hall (M. C.). **A Note on *Syngamus Laryngeus* from Cattle in the Philippine Islands.**—*Amer. Jl. Vet. Med.* 1915. June. Vol. 10. No. 6. pp. 395–396. With 3 text-figs.

The parasite found in the Philippine Island is identical with that described by Railliet save that the males are a little shorter and the females a little longer. The males measure 2·75 to 3·1 mm. and the females 9·7 to 12 mm.

Among the specimens examined were found males that were attached to females by means of the buccal capsule. In one instance this was the only manner in which the male was attached to the female, and in another case the male was attached to the female by the caudal pouch and to another female by the buccal capsule. There is no record of this worm producing any pathological effects in the Philippines.

(174) Mitzmain (M. B.). **An Experiment with *Stomoxys calcitrans* in an Attempt to transmit a Filaria of Horses in the Philippines.**—*Amer. Jl. Trop. Dis. & Prevent. Med.* 1915. June. Vol. 2. No. 12. pp. 759–763. With 1 plate.

Two hundred newly emerged Stomoxys were allowed to bite a horse whose blood always contained active filariae and on the day upon which the flies were fed contained as many as 12 to a single field under a low power. All but three of the flies fed. On the following day 170 of them again engorged themselves with blood containing a moderate number of active embryos. They were kept till the fourth day following without feeding and then they were used during a period of about five weeks, until there were only four flies left, to feed upon four horses at varying intervals. These four horses had been used in a surra experiment and had failed to become infected, and a daily examination of their blood during a period of two months had not revealed the presence of any filariae.

As a control 200 other laboratory-bred flies were allowed to feed on a healthy horse, and the daily death-rate noted. When the death-rates of the two sets of flies were compared it was seen that more than twice the number of deaths occurred among the filaria-fed flies during the first ten days than among the control flies, but that after this there was no marked difference in the death-rate in the two series.

In one instance the gut-contents of a fly that had ingested infected blood was examined, and one of the filaria found was being ingested by a polymorphonuclear leucocyte. It is suggested that this may be the explanation of the non-development of a number of the embryos ingested by the flies.

From the fifth to the eighth day after ingesting the infected blood 31 flies were dissected. In three of these larval worms were found embedded in the thoracic muscles. Flies dissected after the eighth day showed no evidence of having been invaded by parasites.

"During the entire period of the experiment the five horses were kept in individual stalls in a screened stable. The blood of the four healthy animals was examined two to three times weekly for sixty days after the final fly application. They were also examined a month later, when all appearances of blood infection were absent."

(175) Meggitt (F. J.). **A new Species of Tapeworm from a Parakeet, *Brotogerys tirica*.—*Parasitology*.** 1915. June. Vol. 8. No. 1, pp. 42–55. With 2 plates comprising 19 figs. & 4 text-figs.

The author gives in a tabular statement the distinguishing features of the species belonging to the genus *Cotugnia* already described, and shows that the parasite described in this paper differs from these in so many details that a new species is justified for it. For this new species he suggests the name *Cotugnia brotogerys*. The following description is given under the heading "Specific diagnosis."

"*Cotugnia*: 75 mm. long by 2 mm. broad. Head: 0·42 mm. in diameter, 0·45 mm. long, with retractile rostellum 0·15 mm. in diameter, armed with a crown of numerous hooks arranged in a double row. Hooks [of the Davainea type], 0·012 mm. long. Suckers oval, unarmed, 0·081 mm. in diameter. Neck absent. Segments trapezoidal and imbricate. Genital organs double in each segment, genital pore situated at the anterior third of the lateral margin. Male and female canals pass dorsal to the excretory system.

"*Musculature*: Three longitudinal muscle layers alternate with three transverse layers.

"*Male genitalia*: Tests numerous in a double row, occupying the centre of the proglottis and extending laterally beyond the excretory canals. Cirrus pouch not reaching the longitudinal excretory canal.

"*Female organs*: Yolk-gland posterior to ovary. Receptaculum seminis spherical. Ovary strongly lobed. Yolk-gland compact, little lobed. No persistent uterus present. Eggs enclosed in parenchymatous capsules, each containing several eggs. Egg has three membranes.

"*Life history*: Unknown.

"*Host*: *Brotogerys tirica*.

"*Locality*: Brazil."

BITING FLIES.

(176) Yorke (W.) & Blacklock (B.). **Notes on the Bionomics of *Glossina palpalis* in Sierra Leone, with Special Reference to its Pupal Habitats. (Being the First Report of the Thirty-second Expedition of the Liverpool School of Tropical Medicine, 1914–1915).—*Ann. Trop. Med. & Parasit.*** 1915. July 31. Vol. 9. No. 3. pp. 349–362. With 7 plates & 1 map.

The observations recorded in this paper were carried out during a visit to Sierra Leone, the primary object of which was to fix upon a site suitable for the erection of a permanent laboratory.

Among the subjects into which investigation was made was the bionomics of *Glossina palpalis*, and Cape Lighthouse Peninsula which lies at the mouth of the Sierra Leone River, and of which a somewhat detailed description is given, was considered to be a suitable place at which to start investigations.

Success immediately followed a search for pupae, which were found on or just below the surface of the ground in the interior of a hollow tree. This tree was situated about 100 yards from the sea and at least a quarter of a mile from the nearest fresh water, which consisted of a small well.

Subsequent investigations showed that numerous puparia could be found on or just below the surface of the ground around any of

the oil palms from which the lower petioles had not been removed, and which in consequence shaded an area of ground in the immediate neighbourhood of the trunk. It was a striking fact however that they were not to be found except in solitary instances in the soil held in the angles between the petioles and the trunks. Only occasional puparia were found at the bases of mangoes and cotton trees.

Although tsetse were found among the mangrove swamps at least half a mile from dry land no puparia were found in the sandy mud of the swamps either at high or at low tide. They were found however under the palms immediately above high water mark. Experiment showed that pupae deposited on sea water or covered with sea water for a number of hours each day do not hatch. The authors' conclusions are as follows:—

"1. The breeding grounds of *Glossina palpalis* are not so strictly limited to the immediate vicinity of water as has hitherto been thought; they may occur quite independently of fresh water and at least a quarter of a mile from sea water.

"2. Although *Glossina palpalis* is to be found in considerable numbers in mangrove swamps and may travel in these to a distance of at least half a mile from dry land, the swamps do not constitute a breeding ground of the fly.

"3. The pupae of *Glossina palpalis* do not hatch when subjected to daily flotation on sea water.

"4. The ground around the trunk of oil palms (*Elaeis guineensis*) which have not been stripped of their lower petioles constitutes an excellent breeding place for *Glossina palpalis*.

"5. *Glossina palpalis* can breed in localities in which practically the only tree is the oil palm.

"6. Stripping the oil palm of the lower petioles would suffice to destroy the breeding ground in such localities."

(177) Bequaert (J.). **Note sur la dispersion des Glossines au Congo belge.** [Note regarding the Dispersion of Glossinae in the Belgian Congo.]—*Bull. Soc. Path. Exot.* 1915. July. Vol. 8. No. 7. pp. 463–467.

This paper contains a record of the places in which the author has encountered *G. palpalis*. On two occasions he has seen Glossinae being attacked by a carnivorous spider and a dragon-fly respectively, and he thinks that these enemies of the tsetse flies are not altogether negligable.

Tsetse flies have never been found by the author at an altitude higher than 1,200–1,250 metres and he thinks that some error has been made with regard to the *G. palpalis* var. *fuscipes* said to have been found by Cronier at from 1,500 to 3,000 metres.

It would appear that in inhabited regions the male and female flies are present in about equal numbers, with possibly a small balance in favour of the female, but in uninhabited areas there is a distinct predominance of the males.

In commenting on this paper Roubaud states that it would be unwise to affirm the absence of the flies from any particular area without taking into consideration their seasonal migrations, and he also points out that the apparent predominance of males in uninhabited areas may be due to the fact that food supplies are scarce in such places, and that the more active male is more in evidence than is otherwise the case.

(178) Neave (S. A.). **The Tabanidae of Southern Nyasaland with Notes on their Life-Histories.**—*Bull. Entom. Research.* 1915. Mar. Vol. 5. No. 4. pp. 287–320. With 30 text-figs. & 5 plates.

The flies described in this paper were nearly all collected in the neighbourhood of Mt. Mlanje, close to which the author had his headquarters on the Luchenya River.

A brief description of the area covered is given and special attention is drawn to the rainfall in one part of it. On the southern and south-eastern slopes of the mountain the average fall is about 100 inches, while in other parts it is only 35 inches. This is accounted for by the fact that all the rain clouds come up from the south and south-east.

On the higher plateaus of the mountain the only representative of the genus Tabanus was *T. taeniola variatus*, Wlk. The genus Haematopota was largely represented by *H. distincta*, Ric., and by a few examples of other species. The only other Tabanid discovered in this district was the new species *Silvius monticola*, of which a description is given in the paper.

In the forested areas at a level of from 2,000 to 3,000 feet lower than the plateaus Tabanidae were more common, but members of the genus Tabanus were still not numerous. *Haematopota nobilis* was fairly common and the new species mentioned was largely represented. *C. magnifica* var. *inornata* was the only species of Chrysops found in this area.

In the heavily wooded areas at the foot of the mountain Tabanidae were not numerous, but a number of different species were represented. The most remarkable species obtained, *Silvius apiformis*, bears a singular resemblance to the honey-bee, and it is possible that a new genus will have to be formed for this species. In the drier country outside the range of the climatic influences of Mt. Mlanje, Tabanidae, and in particular members of the genus Tabanus, were especially numerous.

As the study of the breeding habits of the Tabanidae were the principal object of the author's expedition efforts were made to obtain larvae, at first with little success owing to the work having been begun at the wrong season, but afterwards with considerable success as regards numbers if not species. The first successes were obtained in the valley of the lower Shire and the Mwanza, and the experience obtained there rendered the discovery of larvae at the headquarters at Mlanje easier. From August to February considerable numbers of larvae of Tabanus, Chrysops and Haematopota were obtained, and from them adults were bred in most cases.

From the evidence obtained it would appear that the Tabanids of Nyasaland have only one brood a year, but it is possible that certain species of Chrysops and Haematopota may have two broods. Much however depends no doubt upon the food supply for the larvae, and climatic and other conditions.

In many cases the larva grows very slowly and may require six months before it is full-grown. The larvae then have a resting period during which they remain buried in mud or sand. In the author's experience the pupal stage is very short, ranging only from 10 to 18 days.

One of the difficulties encountered in connection with the question of the number of broods per annum lay in the fact that the larvae from

any batch of eggs may show a very variable rate of growth, which results in the emergence of the adults being spread over long periods. There appears to be a possibility that individuals which miss their normal period for pupation may remain in the larval stage until the following year.

Before larvae have reached their full development they usually lie buried in mud head downwards with their syphons projecting above the surface. In the subsequent resting stage the syphons do not appear to be used, for the larvae may remain several inches below the surface for periods extending into months. Pupation generally takes place in normal conditions about an inch below the surface of the mud, the pupa being upright in position. When pupation is complete and the case has hardened the pupa works its way up until the head is just below the surface. The pupa is generally yellowish or greenish in colour at first, but it darkens as the imago develops.

The imagines of all species almost invariably emerge between noon and 3 p.m. and the method of emergence is the same in all species.

Considerable difficulty was experienced in keeping various Tabanidae alive in captivity, but by adapting the cages in various ways a certain degree of success was obtained.

In a few cases captive flies oviposited, the process requiring about an hour. The cement material covering the egg masses appears to be very resistant, as immersion of the masses in 70 per cent. alcohol for two days did not absolutely prevent hatching in some instances.

In the cases observed hatching took place on the fifth day, but the interval varied with the temperature. The young larvae grow very slowly at first and differ from the more mature ones by being far more active.

Characters which appear to be of value in the differentiation of species are, the arrangement of the group of hooks at the termination of the last segment, and the nature of the uppermost section of the series of combs on the anterior part of the last segment of the pupae. For the former of these features the author suggests the term " aster."

The areas of pigmented hairs on the base of the last segment of the larvae appear to be of value as distinguishing characters, especially among the Haematopota.

The paper contains short accounts of the adult flies, pupae and larvae obtained, many of the descriptions being illustrated.

(179) Bulletin of Entomological Research. 1915. Mar. Vol. 5. Pt. 4. pp. 381–382. **Observations on *Glossina morsitans* in Northern Rhodesia.** [Eminson, R. A. F.]

The report contains an account of the author's investigations into the bionomics of *G. morsitans* carried out in Northern Rhodesia from May to July, 1914.

While no definite reason could be ascertained for the marked preference given to certain restricted areas for breeding purposes, it was observed that breeding never occurred in areas where there was any depth of sandy soil, and where there was long grass. The places preferred were close to the paths among trees where there was only a very thin layer of sand on the granite, and where there was only a

little short grass. Game did not seem to be more numerous or even as numerous in the areas where the flies were found as elsewhere. It appeared that the females preferred logs which were devoid of bark and which were raised up from the ground for an inch or two at one end for the depositing of their larvae.

Experiments in connection with the feeding of flies exclusively upon avian blood failed owing to the unsuitable nature of the cages used.

During May 1914, 300 flies were examined as to the nature of their intestinal contents. Recognisable blood was found in 43 of them, and in all but two mammalian blood was found. Of the flies examined during February and March it is said that only 1 per cent. contained non-mammalian blood, but the actual numbers are not given. This may be explained partly by a seasonal variation of available food supply, and partly on the supposition that during May the greatest number of larvae are deposited and that the flies during that month would be more voracious.

Some interesting points are dealt with in connection with the parasites of *G. morsitans*. A wingless parasitic wasp of the genus Mutilla was obtained from one puparium in a batch of 258. The parasite made its escape exactly as would have the fly, and it was impossible to say from an external examination of the pupa that it was parasitised. Of 84 pupae which remained unhatched towards the end of August, seven were opened. Two contained the larvae of the parasite, and the other five pupae had died from other causes. Two males and eight females of the genus Mutilla hatched out from among the remaining 77 puparia.

A Chalcid has also been found attacking tsetse pupae on three occasions.

(180) Lamborn (W. A.). **A Preliminary Report on the Problem of controlling Glossina in Nyasaland.**—*Bull. Entom. Research.* 1915. June. Vol. 6. No. 1. pp. 59–65.

The author's first object was to discover a small isolated area where experiments could be carried out both by clearing and by capture of the flies on a large scale to determine the effects of these measures upon the numbers of flies present. With this object he proceeded to the areas described by Shircore [see this *Bulletin*, Vol. 2. No. 3. p. 147.]

A brief description of his examination of the areas is given and his observations are summarised as follows :—

"No evidence of the natural splitting of the northern portion of the fly area in the dry season into two *small* localised patches was found, though two large areas do certainly exist as a result of the subdivision of one larger one by native clearings; and in the southern portion, examined after a few scanty rains, the two so-called "primary centres" were certainly continuous with each other and with the northern portion of the area, the fly extending over so large a region as to make one sceptical in regard to the possibility of their limitation to within narrow patches so short a time before."

The undoubted concentration of the fly in this district in the dry season is coincident with the concentration of the game and is due to the nature of the soil; the conditions of moisture and, in consequence, of vegetation even during the dry season are a sufficient explanation of the concentration of the game and therefore of the fly.

In spite of this the author finds that the foci from which the fly radiate when the grass appears and the game spreads are far too large to permit of any useful results being obtained from efforts to clear the land or catch the flies on a large scale. He has, further, not been able to discover that the "primary centres" form localised breeding grounds.

Flight experiments with *G. morsitans*.—Working with some hundreds of flies the author released them after marking them at distances ranging up to ten miles from the place at which they were caught. He obtained evidence in ten instances of flights of five miles, and in one instance of a flight of ten miles. The country traversed by the flies was well wooded and devoid of open spaces. No flies were recaptured in directions away from the main fly area. None of the flies were fed before they were released.

Records of the numbers of flies captured and the proportions of the sexes have been kept, but as the number of boys working has not been constant and the work has not been uniform no exact deductions can be drawn from the figures given, which show that there were 2,040 males to 420 females.

Attempts to trap flies in a cage the interior of which was smeared with bird-lime and in which a goat was kept were not successful, apparently because the goat could not move about sufficiently to permit the flies to see it.

When bird-lime was smeared upon various materials carried on the backs of boys the number of flies caught in six hours ranged from 7 to 67. Light brown paper appeared to yield the best results.

Among the enemies of *G. morsitans* there has been observed a Bembex which has been seen to seize the flies and carry them away.

Negative results were obtained when flies were caged with caterpillars to see if they would feed upon them.

A new area of fly has been found in the Marimba district of Nyasaland just north of the Duangwa River, where it crosses into Rhodesia.

(181) Yorke (W.) & Blacklock (B.). **Food of *Glossina palpalis* in the Cape Lighthouse Peninsula, Sierra Leone. (Being the Second Report of the Thirty-second Expedition of the Liverpool School of Tropical Medicine, 1914-1915.)**—*Ann. Trop Med. & Parasit.* 1915. July 31. Vol. 9. No. 3. pp. 363–379.

Conclusions:—

"1. About eight per cent. of the wild *G. palpalis* in this district contain recognisable red blood cells—seven per cent. of mammalian origin and one per cent. nucleated red cells of unknown origin.

"2. Seventy-two hours after *G. palpalis* had completely distended itself on rat's blood recognisable red cells could no longer be found in its intestine; after being fed on a fowl nucleated red blood cells could be recognised in 40 per cent. of cases at the end of a similar period. The flies were kept at a temperature of 80°–86° F.

"3. Neither shed blood nor other fluid which is exposed (not covered by a membrane) can be imbibed by *G. palpalis*.

"4. *G. palpalis* can take up through a membrane of fresh skin not only blood and various dilutions of it with normal saline, but also suspensions of red blood cells in normal saline, and solutions of haemoglobin (both freshly made from red blood cells, and the dried crystalline preparation of commerce) in distilled water.

"5. Fluids other than blood such as solutions of sugar, sodium chloride, and glycerine, in water containing a small quantity of a dye (methylene blue, neutral red or fuchsin) are also taken up through a membrane of fresh skin by *G. palpalis*, but not so quickly or so readily as is blood.

"6. *G. palpalis* exhibits a definite selective taste for the various fluids presented to it under the membrane; blood, red cells, and haemoglobin solution being much preferred. The attractive element in the blood is the fraction of the red cells soluble in water, probably haemoglobin.

"7. *G. palpalis* which had been starved for a day or two can often be seen to insert the proboscis repeatedly into oranges. bananas or other fruits which may be offered them.

"8. We are of opinion that *G. palpalis* in nature may under certain conditions take up fluid other than blood."

(182) WATERSTON (J.). **Chalcidoidea bred from *Glossina morsitans* in Northern Rhodesia.**—*Bull. Entom. Research.* 1915. June. Vol. 6. No. 1. pp. 69–82. With 5 text-figs.

This report is based upon specimens and notes supplied by LLOYD, and deals with three species of Chalcidoids which have been bred from puparia collected by LLOYD and EMINSON. Two of the specimens described and figured in the report are believed to be new. In a note by the editor it is shown that seven parasitic insects of Glossina are now known, and in a short table are given the names of the parasites, their hosts, the locality of their discovery, and the name of the investigator discovering them. Five of the parasites are Hymenoptera and two Diptera.

(183) HIRST (S.). **On a Widely distributed Gamasid Mite (*Leiognathus morsitans*, sp. n.), Parasitic on the Domestic Fowl.**—*Bull. Entom. Research.* 1915. June. Vol. 6. No. 1. pp. 55–58. With 3 text-figs.

The parasite described by the author has a wide distribution in Africa, and also occurs in Mauritius, China, India, and South America, and it is suggested that it may play some part in the transmission of spirochaetes and other parasites of the fowl. It is not settled whether the parasite is identical with that described by BERLESE as *Leiognathus bursa*.

MISCELLANEOUS.

(184) **BOQUET (A.) & NÈGRE (L.). Sur l'évolution du parasite de la lymphangite épizootique chez le cheval.** [The Development of the Parasite of Epizootic Lymphangitis in the Horse.]—*Bull. Soc. Path. Exot.* 1915. May. Vol. 8. No. 5. pp. 248–250.

The authors record that they have attempted to infect horses by subcutaneous, intradermic and intravenous inoculation with pure cultures of the seventh and ninth generations of the cryptococcus, but that so far they have failed to set up the disease with the characteristic lesions. They have however constantly obtained a result which requires further investigation and verification, but which they think it advisable to publish pending their being able to return to the study of the subject.

A horse which had never shown any evidence of being infected was inoculated with a pure culture by both the intradermic and the subcutaneous methods at different parts of the body, and as no evidence of infection had appeared after an interval of two months it was given an intravenous inoculation with 1 cc. of a similar culture. Three weeks later an area of oedema appeared on the fore-arm about 15 centimetres below one of the points where intradermic inoculation had been practised. This persisted for about a week and the spot was subsequently marked by a slight loss of hair and an elevation of the epidermis.

Microscopic examination of the epidermis showed the following stuctures in small numbers. There were typical double-contoured cryptococci, rather large rounded forms, some of which showed evidence of budding collected together into masses of 10 to 15, and short thick-walled filaments which were swollen at one end exactly like the chlamydospores observed in the cultures. The lesion subsequently healed. No structures of the same type could be found in materials scraped from other parts of the skin.

(185) HEDINGER. **Pathological Investigation into Lamziekte.**—*Report to the Minister of Agriculture. 1914. Dec.* 1915. Pretoria: Published by the Government Printing and Stationery Office.

After dealing at some length with the previously published records regarding the disease the author passes to a short description of each of 52 cases examined. Summarising the lesions found in these he finds that special importance attaches to the presence of degenerative lesions and inflammatory changes in the muscle and nerves respectively.

The author then deals with the theories that have been put forward at different times to explain the symptoms and lesions of the disease. He finds that these—the infection, the poisonous plant, the want of nutrition, and the accumulative vegetable poison theories—are all unsatisfactory.

The general opinion arrived at is that the disease is in some way connected with the presence of sarcosporidia in the muscles, although these parasites may be found in the muscular tissues of animals that are not affected.

The last paragraph but one in the author's report is as follows :—

"Lamziekte is a disease which is very well characterised by histological changes of the cross-striated muscles, and in most cases of the nervous system, and by the presence of sarcosporidia. Although, owing to the incomplete knowledge of the sarcosporidia it is still not possible to prove experimentally the importance of the sarcosporidiosis for the lamziekte, it is quite possible, taking into consideration the facts that are known about sarcosporidia, that these protozoa are the cause of lamziekte. The sarcosporidiosis explains without difficulty the whole nature of lamziekte. Be it that the sarcosporidia are or are not responsible for lamziekte, in all further investigations the question of the importance of sarcosporidia must have the first place."

(186) BEVAN (Ll. E. W.). **Contagious Abortion in Rhodesia**—*Jl. Comp. Path. & Therapeutics.* 1915. June. Vol. 28. No. 2. pp. 97–104.

In this paper the author records the occurrence of contagious abortion in cattle in Rhodesia, and shows that the organism responsible for the disease is identical with that causing it in Europe and other parts of Africa.

Details of a few experiments regarding the production of agglutinin with living and dead bacilli are given, by which it is shown that the injection of dead bacilli will cause the production of agglutinin in proportion to the dose of bacilli given. But, as stated by the author, no conclusions can be drawn as to the respective value of the methods for producing immunity.

REPORTS.

(187) Gray (C. E.). **Annual Report of the Union of South Africa, 1913-1914. Veterinary Division.** 1914. Aug. 10. 24 pp.

East Coast Fever.—General progress has been made in dealing with this disease, but in certain areas difficulties are experienced. These are due in part to insufficient numbers on the veterinary staff, unwillingness of some owners to take sufficient care of their stock, and the difficulties encountered in dealing with native owners.

Tuberculosis.—Lack of funds prevents this disease being taken in hand in a manner likely to lead to its proper control, and it is pointed out that unless steps are taken soon the hold gained by the disease may become too great to allow it to be dealt with radically. The percentage of reacting animals has risen from 2·35 to 4·87 since last year. Of imported animals 3·8 per cent. reacted to the tuberculin test and were destroyed.

Anthrax is becoming more and more serious and in places is likely to become such a scourge that general protective inoculation will have to be practised.

Glanders, lungsickness, equine marge, epizootic lymphangitis, swine fever, and contagious abortion appear to be held well in hand.

Book Review.

(188) Banham (George A.) [F.R.C.V.S.] & Young (Wm. J.) [F.R.C.V.S., D.V.S.M. (Vict.).] **Table of Veterinary Posology (In Accordance with the British Pharmacopoeia, 1914) and Therapeutics with Weights, Measures, etc., for the Use of Students and Practitioners.** —4th Edit. xvi + 272 pp. f'cap. 8vo. 1915. London: Baillière, Tindall & Cox. [Price 3*s.* 6*d.* net.]

Seven years have elapsed since the third edition of this book was published. The edition which has just come to hand has been necessitated by the appearance of the new British Pharmacopoeia issued last December.

The book should prove of even more value than hitherto as it contains much new material. In fact every branch of the veterinary art seems to have been dealt with, and the general plan is such that it should enable anyone to obtain information regarding a doubtful point quite readily.

The great bulk of the contents of the volume is given in tabular form, and strangely enough the least satisfactory section is that from which the volume gets its title, namely, the table enumerating the pharmacopoeial drugs, their preparations, and their doses. Many of the drugs mentioned are not official in the British Pharmacopoeia, and consequently they cannot be accurately described as "pharmacopoeial drugs." A few more cross-references would add to the value of this table. For instance, we are not reminded that barbitone is the pharmacopoeial name for veronal, nor that benzamine lactate is β-eucaine.

In one or two instances there have crept in inconsistences in the doses. The dose of acetosalicylic acid for the dog is given as 5–15 grains; under aspirin the dose is 2–10 grains. Again, the dose of barbitone is given as 2–10 grains, of veronal 10–60 grains.

The passage of the third-year student through his classes would be rendered less arduous were there an official list of drugs used in veterinary medicine with a table of standardised doses. The suggestion forces itself upon one that the authors should attempt something of the kind in their next edition. The tinctures might first be taken in hand. In the British Pharmacopoeia the tinctures are divided into two main divisions, those of which the dose is 5–15 minims, and those of which the dose is ½–1 fluid drachm. In the table referred to matters are very different. Thirteen tinctures picked at random show nine different doses, whereas they could readily be put into two groups as in the B.P.

The next section deals with official and other formulae. In some cases the strengths of the preparations given in this table do not agree with those given in the one mentioned above. This is particularly noticeable in the case of the preparations of iodine. The question of solubilities appears hardly to justify the expenditure of 24 pages upon it.

The diseases of the domesticated animals are dealt with in sections upon protozoa, bacteria, parasites, etc.

Food-stuffs and feeding receive due consideration and the information given should be of value to the practitioner who is required to suggest alternative diets.

The table of anatomical weights, capacities, and measurements contains many useful data not usually so conveniently collected together. A further very useful table is that showing the special terms that are applied to animals at various ages.

Altogether the book is crammed with information of all kinds, not even excluding postal information.

The volume might be called the veterinary surgeon's *vade mecum*, and it should take first place as a book of reference in very small compass.

B. Gorton.

RECENT LITERATURE.

[Continued from this *Bulletin*, Vol. 3, No. 2, pp. 78–79.]

Leishmaniasis.

(189) LAVERAN (A.). Leishmaniose américaine de la peau et des muqueuses. [American Leishmaniasis of the Skin and of the Mucous Membranes.]—*Bull. Soc. Path. Exot.*, 1915. May. Vol. 8. No. 5, pp. 284–301; No. 6, pp. 382–397.

(190) SERGENT (Ed.), SERGENT (Et.), LEMAIRE (G.), & SENEVET (G.). Hypothèse sur le phlébotome "transmetteur" et la tarente "réservoir de virus" du bouton d'Orient. [The Hypothetic Phlebotomus Transmitter and Lizard Reservoir of Oriental Sore.]—*Ann. Inst. Pasteur*, 1915. July. Vol. 29. No. 7, pp. 309–322.

(191) SPAGNOLIO (G.). Leishmaniosi canina ed umana e loro presunta dipendenza genetica. [The Supposed Relationship between Canine and Human Leishmaniasis.]—*Malaria e Malat. d. Paesi Caldi*, 1915. May–June. Vol. 6. No. 3, pp. 156–157.

Spirochaetosis.

(192) FANTHAM (H. B.). *Spirochaeta bronchialis*, Castellani, 1907, together with Remarks on the Spirochaetes of the Human Mouth.—*Ann. Trop. Med. & Parasit.*, 1915. July 31. Vol. 9. No. 3, pp. 391–412. With one plate comprising 68 figs.

Trypanosomiasis.

(193) AUBERT (P.). Sur deux cas de Trypanosomiase observée chez des Européens au Congo Français. [Two Cases of Trypanosomiasis observed in Europeans in the French Congo.]—*Bull. Soc. Path. Exot.*, 1915. June. Vol. 8. No. 6. pp. 372–377.

Biting Flies and Ticks.

(194) BEQUAERT (J.). Sur quelques Auchméromyies du Congo. [Some Auchmeromyias of the Congo.]—*Bull. Soc. Path. Exot.*, 1915. July. Vol. 8. No. 7, pp. 459–462. With 1 text-fig.

(195) BOUET (G.) & ROUBAUD (E.). Nouvelle observation sur les Chéromyies de l'Afrique Occidentale. [New Observation regarding the Cheromyias of West Africa.]—*Bull. Soc. Path. Exot.*, 1915. Vol. 8. No. 7, pp. 462–463.

(196) EDWARDS (F. W.). New and Little-Known East African Culicidae.—*Bull. Entomol. Research*, 1915. Mar. Vol. 5. No. 4, pp. 273–281. With 3 text-figs.

(197) EDWARDS (F. W.). Diagnoses of New Bornean Culicidae.—*Bull. Entomol. Research*, 1915. Mar. Vol. 5. No. 4, pp. 283–285.

(198) HARRISON (L.). Mallophaga from Apteryx, and their significance; with a Note on the Genus Rallicola.—*Parasitology*, 1915. June. Vol. 8. No. 1, pp. 88–100. With 6 text-figs

(199) HARRISON (L.). The Respiratory System of Mallophaga.—*Parasitology*, 1915. June. Vol. 8. No. 1, pp. 101–127. With 21 text-figs.

(200) MACFARLANE (H.). The Stegomyia Survey in Hong Kong.—Abstract of Interim Report to Colonial Office in the *Bull. Entom. Research*, 1915. June. Vol. 6. No. 1, pp. 67–68.

(201) ROBINSON (L. E.). A Note on the Variability in size of *Amblyomma hebraeum* Koch.—*Parasitology*, 1915. June. Vol. 8. No. 1, pp. 11–16. With 3 text-figs.

(202) Rodhain (J.). Note sur la ponte des Oestrides des genres Gyrostigma et Cobboldia. [Note on the Oviposition of the Oestridae of the Genera Gyrostigma and Cobboldia.]—*Bull. Soc. Path. Exot.*, 1915. May. Vol. 8. No. 5, pp. 275–279. With 1 fig.

(203) Rodhain (J.) & Bequaert (J.). Sur quelques Oestrides du Congo. (Communication préliminaire.) [Certain Oestridae of the Congo. Preliminary Communication.]—*Bull. Soc. Path. Exot.*, 1915. July. Vol. 8. No. 7, pp. 452–458.

(204) Stanton (A. T.). A New Anopheline Mosquito from Sumatra. —*Bull. Entomol. Research*, 1915. March. Vol. 5. No. 4, pp. 373–375. With 2 text-figs.

(205) Strickland (C.). The Comparative Morphology of the Anophelines *Nyssomyzomyia ludlowi*, Theo., and *N. rossi*, Giles.—*Bull. Entomol. Research*, 1915. Mar. Vol. 5. No. 4, pp. 321–324. With 2 text figs. & 2 plates.

(206) Turner (R. E.). A New Species of Mutilla Parasitic on *Glossina morsitans*.—*Bull. Entomol. Research*, 1915. Mar. Vol. 5. No. 4, p. 383. With 1 text-fig.

Helminths.

(207) Barker (F. D.). Parasites of the American Muskrat (*Fiber zibethicus*).—*Jl. of Parasit.*, 1915. June. Vol. 1. No. 4, pp. 184–197. With 2 plates & 4 text-figs.

(208) Franchi (A. F.). Contributo allo Studio della dermofilariosi bovine. (Bovine dermofilariasis.)—*Il. Mod. Zooiatro.* Parte Scientifica. 1915. June. Vol. 26. No. 6, pp. 260–267. With 4 text-figs.

(209) Nicoll (W.). The Trematode Parasites of North Queensland. III. Parasites of Fishes.—*Parasitology*, 1915. June. Vol. 8. No. 1, pp. 22–40. With 2 plates comprising 11 figs.

(210) Railliet (A.) & Henry (A.). Sur les Nématodes du genre *Goezia* Zeder. [The Nematodes of the Genus *Goezia* Zeder.] —*Bull. Soc. Path. Exot.*, 1915. May. Vol. 8. No. 5, pp. 270–275.

(211) Seurat (L.-G.). Sur les Rictulaires des Carnivores du Nord-Africain et les affinités du genre Rictularia. [The Rictulariae of the North African Carnivora and the Relationships of the Genus Rictularia.)—*C. R. Soc. Biol.*, 1915. June 25. Vol. 78. No. 11, pp. 318–322. With 3 text-figs.

(212) Tirumurti (T. S.). A Case of Perforation of the Aorta by *Spiroptera sanguinolenta* in a Hound.—*Vet. Jl.*, 1915. Aug. Vol. 71. No. 482, pp. 384–387. With 2 text-figs.

Miscellaneous.

(213) Chatelain (M.). Sur le traitement de la Lymphangite Epizootique. [The Treatment of Epizootic Lymphangitis.]—*Rev. Gén. Méd. Vét.*, 1915. July 1. Vol. 24. No. 284–285, pp. 387–392.

(214) van Saceghem (R.). Dermatose contagieuse (Impétigo contagieux). [Contagious Dermatitis.]—*Bull. Soc. Path. Exot.*, 1915. June. Vol. 8. No. 6, pp. 354–359.

(215) van Saceghem (R.). Etude sur une épizootie parmis les gorets de la station d'élevage de Zambi. [An Epizootic among the Young Pigs at the Breeding Station at Zambi.]—*Bull. Soc. Path. Exot.*, 1915. June. Vol. 8. No. 6, pp. 360–362.

(216) van Saceghem (R.). Observations sur la Dermite granuleuse. [Granular Dermatitis.]—*Bull. Soc. Path. Exot.*, 1915. June. Vol. 8. No. 6, pp. 362–363.

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